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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/695,960	10/28/2003	Sergey A. Kuchinsky	SP02-173	8006

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EXAMINER	
CONNELLY CUSHWA, MICHELLE R	

ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 06/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)
	10/695,960	KUCHINSKY ET AL.
	Examiner	**Art Unit**
	Michelle R. Connelly-Cushwa	2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 16 March 2006.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-12 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-12 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 23 April 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. ______.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's Amendment filed March 16, 2006 has been fully considered and entered.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US 2003/0053733 A1) in view of Koroteev et al. ("Compression of ultrashort light pulses in photonic crystals: when envelopes cease to be slow", 1999, cited by Applicant).

Regarding claims 1-3; Wang et al. discloses a dispersion element (see Figures 3n-3p), wherein:

- the dispersion element is based on a planar photonic crystal structure (grating, 226) made as a one-dimensional (1D) periodic structure (see Figure 3m for a top down view

showing grating 226 being formed as a one-dimensional structure);

- the planar photonic crystal structure (grating, 266) is formed in a layer of a high index material (214) having a predetermined thickness and refractive index n_2 (see paragraph [0056]);
- the high index material layer (214) is deposited on a substrate (202) with refractive index n_1, at $n_2 > n_1$,
- the periodic structure comprising a plurality of parallel grooves (226, see Figures 3l-3p) having a predetermined width and depth, made in the high index layer at equal distance from each other,
- wherein the pulse propagates in the dispersion element perpendicularly to the grooves (see Figures 4a and 4b); and
- wherein the periodic structure (226) is covered with a protective layer (228, 232; see paragraph [0062], where Wang et al. discloses that the layer 228 may be used as the cover layer 232 and may having a refractive index lower than the high index layer, 214) made of a material with a predetermined refractive index n_3 to provide mechanical strength and reduce scattering loss, where n_3 <

n_2 by a value providing guided propagation of the pulse in single-mode operation.

Wang et al. does not specifically state that the dispersion element is for a laser pulse compression device adapted to compress a phase-modulated pulse or that a length of the dispersion element is defined to provide maximum compression of the phase-modulated pulse.

Koroteev et al. teaches that one-dimensional photonic band gap (PBG) structures may advantageously be used to compress laser pulses (see the abstract, the second full paragraph on page 192, and Appendix A). In Appendix A, Koroteev et al. further teaches that maximum compression of the phase-modulated pulse is obtained when the length of the dispersion element (the one-dimensional PBG structure) is defined by the physical relationship derived from known properties of wave packet propagation (see equations A1.10 and A1.11, it is noted that equation A1.11 is the same as that claimed in claim 3 of the present application).

Given the suggestion of Koroteev et al. to use a one-dimensional PBG structure to maximally compress laser pulses by forming the PBG structure with a length given by equation A1.11, and the teachings of Wang et al. directed to the production of one dimensional optical gratings, one of ordinary skill in the art would have found it obvious to form the one-dimensional PBG structure (grating, 226) disclosed by Wang et al. to obtain maximal compression of laser pulses.

Claims 4-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US 2003/0053733 A1) in view of Koroteev et

al. ("Compression of ultrashort light pulses in photonic crystals: when envelopes cease to be slow", 1999, cited by Applicant) and Charlton et al. (US 6,901,194 B2).

Regarding claims 4, 6 and 7; Wang et al. discloses a dispersion element (see Figures 3n-3p), wherein:

- the dispersion element is based on a planar photonic crystal structure (grating, 226) made as a two-dimensional periodic structure (see paragraph [0096] in which Wang et al. discloses that the gratings may be multi-dimensional) with a predetermined period *a*,
- the planar photonic crystal structure (grating, 266) is formed in a layer of a high index material (214) having a predetermined thickness and refractive index n_2 (see paragraph [0056]);
- the high index material layer (214) is deposited on a substrate (202) with refractive index n_1, at $n_2 > n_1$, and
- wherein the periodic structure (226) is covered with a protective layer (228, 232; see paragraph [0062], where Wang et al. discloses that the layer 228 may be used as the cover layer 232 and may having a refractive index lower than the high index layer, 214) made of a material with a predetermined refractive index n_3 to provide mechanical strength and reduce scattering loss.

Wang et al. does not specifically state that the dispersion element is for a laser pulse compression device adapted to compress a phase-modulated pulse; that a length of the dispersion element is defined to provide maximum compression of the phase-modulated pulse; or that sites of the 2D periodic structure have first holes of a predetermined equal size, forming columns, and second holes of a predetermined equal size different from that of the first holes, forming a predetermined number of adjacent columns, wherein the sizes of the first and second holes and the refractive indices are defined so to provide guided propagation of the phase-modulated pulse in single-mode operation along the columns of the second holes in the structure.

Charlton et al. discloses a dispersion element (see Figure 9a for the planar waveguide structure and Figures 44a and 44b for the photonic crystal structure), wherein

- the dispersion element is based on a planar photonic crystal structure (the holes, 91, defined the photonic crystal structure, as seen Figure 9a from the side and Figures 44a and 44b from the top) made as a two-dimensional periodic structure with predetermined period *a*, formed in a layer of high index material (core, 92) having a predetermined thickness and refractive index n_2,
- the high index material layer being deposited on a substrate (90) with a refractive index n_1, at $n_2 > n_1$, (see column 14, lines 10-29)

- sites of the 2D periodic structure having first holes (441) of a predetermined equal size, forming columns, and
- second holes (442, 443) of a predetermined equal size different from that of the first holes, forming a predetermined number of adjacent columns,
- wherein the sizes of the first and second holes and the refractive indices are defined to provide guided propagation of the phase-modulated pulse in single-mode operation along the columns of the second holes in the structure, and
- wherein the dispersion element has a length.

Koroteev et al. teaches that band gap (PBG) structures may advantageously be used to compress laser pulses (see the abstract, the second full paragraph on page 192, and Appendix A). In Appendix A, Koroteev et al. further teaches that maximum compression of the phase-modulated pulse is obtained when the length of the dispersion element is defined by the physical relationship derived from known properties of wave packet propagation (see equations A1.10 and A1.11, it is noted that equation A1.11 is the same as that claimed in claim 7 of the present application).

Given the disclosure of Charlton et al. directed to a two-dimensional photonic crystal having holes of two different sizes, as discussed above, the suggestion of Koroteev et al. to use a PBG structure to maximally compress laser pulses by forming the PBG structure with a length given by equation A1.11, and the teachings of Wang et al. directed to the production of multi-dimensional

optical gratings, one of ordinary skill in the art would have found it obvious to form the multi-dimensional PBG structure disclosed by Wang et al. to obtain maximal compression of laser pulses, while providing the holes of two different sizes, as taught by Charlton et al., to compensate for edge effects and to provide other optical transmission characteristics as desired.

Regarding claim 5; the 2D periodic structure of Charlton et al. is selected from a trigonal, rectangular or square periodic lattice (see column 31, lines 34-43).

Regarding claims 8 and 9; Charlton et al. discloses that the depth of the first and second holes at the sites of the periodic structure must inherently be equal to, less than or greater than the thickness of the high index material, as no other possible relationship exists. In Figure 9a of Charlton et al., the depth is greater than the thickness of the high index material.

Regarding claim 10; Charlton et al. discloses that distances between centers of the second holes and centers of the nearest first holes at the periodic structure sites can differ from the period of the structure (see Figures 44a and 44b).

Regarding claim 11; Charlton et al. discloses that the first and second holes at the 2D periodic structure sites are in the shape of circular cylinders.

Regarding claim 12; Charlton et al. discloses that the second holes form a single column in the 2D periodic structure, over which column the phase-modulated pulse accomplishes guided propagation in single-mode operation.

Response to Arguments

Applicant's arguments filed March 16, 2006 have been fully considered but they are not persuasive.

The objections to claims 1, 4, 8 and 9, which were set forth in the previous Office action, have been withdrawn in view of Applicant's Amendments.

The rejection of claims 1 and 3 under 35 U.S.C. 102(e) over Parker et al. (US 6,856,737 B1), have been withdrawn, in view of the certified copy of the Russian (2002130193) application and the corresponding translation submitted by Applicant. Parker et al. does not qualify as prior art.

The rejections of claims 4, 5 and 7-12 under 35 U.S.C. 102(e) as being anticipated by Charlton et al. (US 6,901,194 B2) have been withdrawn in view of Applicant's arguments. Charlton et al. does not specifically state that the length of the dispersion element is defined to provide maximum compression of the phase-modulated pulse.

The rejection of claims 1-3 under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US 2003/0053733 A1) in view of Koroteev et al. ("Compression of ultrashort light pulses in photonic crystals: when envelopes cease to be slow", 1999, cited by Applicant) has been maintained.

Applicant states that the application of the general physical laws described by Koroteev in the one-dimensional case to one-dimensional devices is not a straightforward operation as witnessed by applicants specification on page 9, line 9, to page 11, line 7. Applicant states that one of ordinary skill in the art would not apply Koroteev's equation A1.11 to the specification situation described in the present application; that making the planar photonic dispersion compensation

devices of the invention requires considerable sophisticated modeling of the structures under discussion; that Applicants have provided this information and examples of planar photonic devices resulting from their modeling; and that since Wang does not indicate that the dispersion element is for a laser pulse compression device adapted to compress a phase-modulated pulse or that the length of the dispersion element is defined to provide maximum compression of the phase-modulated pulse, applicants submit that there is no teaching or suggestion that would lead one to combine Wand and Koroteev.

First, Wang et al. is relied upon for disclosing a dispersion element based on a photonic crystal structure. Wang et al. is not relied upon for teaching that the dispersion element is used for a laser pulse compression device or that a length of the dispersion element is defined to provide maximum compression of the phase-modulated pulse.

Koroteev et al. is relied upon for the teaching that one-dimensional photonic band gap (PBG) structures may advantageously be used to compress laser pulses (see the abstract, the second full paragraph on page 192, and Appendix A) and that maximum compression of a phase-modulated pulse is obtained when the length of the dispersion element (the one-dimensional PBG structure) is defined by the physical relationship derived from known properties of wave packet propagation (see equations A1.10 and A1.11, it is noted that equation A1.11 is the same as that claimed in claim 3 of the present application).

Since Koroteev et al. teaches or suggests using one-dimensional PBG structures of a particular length to compress laser pulses, and Wang et al.

discloses a one-dimensional PBG structure, one of ordinary skill in the art would have recognized that the teachings of Koroteev et al. could be applied to the PBG structure disclosed by Wang et al. to compress pulses, as discussed in the rejection set forth above.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, one of ordinary skill in the art would have had the general teaching of Koroteev et al. that PBG structures could be used for pulse compression by applying equation A1.11 to the length of the PBG structure.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Wang et al. is not relied upon for teaching pulse compression or a particular length for maximum pulse compression.

Applicant's have not pointed out a particular feature of the present invention that is not suggested by the prior art. Applicants have stated that one of ordinary skill in the art would not apply the equation of Koroteev et al. to the

situation described in the present application. The rejection set forth, however, indicates that one of ordinary skill in the art would apply the equation of Koroteev et al. to the PBG structure of Wang et al., since Koroteev et al. teaches that the equation is used to determine a length of a PBG structure for pulse compression, in order to form a pulse compressor with a known PBG structure.

The rejections of claims 4, 6 and 7 under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US 2003/0053733 A1) in view of Koroteev et al. ("Compression of ultrashort light pulses in photonic crystals: when envelopes cease to be slow", 1999, cited by Applicant) and Charlton et al. (US 6,901,194 B2) have been maintained.

Applicant states that making the planar photonic dispersion compensation devices of the present invention requires considerable sophisticated modeling of the structures under discussion; that one of ordinary skill in the art would not apply Koroteev's equation A1.11 to the specific situation described in the present application; that Applicant's have provided the necessary information and examples of planar photonic devices resulting from their modeling; and that Wang does not indicate that the dispersion element is for a laser pulse compression device adapted to compress a phase-modulated pulse or that the length of the dispersion element is defined to provide maximum compression of the phase-modulated pulse; and that there is no teaching that would lead one to combine Wang with Charlton and Koroteev.

These arguments have been addressed above. Charlton provides additional disclosure relating to PBG structures. One of ordinary skill in the art

would have found it obvious to incorporate teachings related to various PBG structures into other PBG structure devices to achieve desired results or effects, as taught by the prior art. Koroteev suggests using PBG structures for pulse compression and that the PBG structures should have a particular length for maximum compression, as defined by equation A1.11.

Applicant's have not pointed out a particular feature of the present invention that is not suggested by the prior art.

With respect to claims 5 and 7-12, the grounds of rejection set forth in the prior Office action has not changed, since it was set forth that Charlton et al. taught all of the limitations of these claims, as applied in the previous Office action, and that the combination of Wang et al., Koroteev et al. and Charlton et al. suggests all of the limitations of base claim 4. Therefore, no new rejections have been presented in the present Office action.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will

the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning the merits of this communication should be directed to Examiner Michelle R. Connelly-Cushwa at telephone number (571) 272-2345. The examiner can normally be reached 9:00 AM to 7:00 PM, Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney B. Bovernick can be reached on (571) 272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general or clerical nature should be directed to the Technology Center 2800 receptionist at telephone number (571) 272-1562.

Michelle R. Connelly-Cushwa

Michelle R. Connelly-Cushwa
Patent Examiner
May 25, 2006